CLAIMS

What is claimed is:

1. A fuel cell current collection system, comprising:

a fuel cell stack comprising fuel cells stacked in a predetermined stacking direction; and

an end plate assembly disposed at one end of the fuel cell stack, the end plate assembly comprising:

an end plate; and

a current collector passing through the end plate, electrically coupled to the fuel cell stack, and configured to collect current from the fuel cell stack.

2. The fuel cell current collection system of claim 1, wherein the current collector has a substantially longitudinal orientation with respect to the stacking direction.

3. The fuel cell current collection system of claim 1, wherein the end plate is formed of a non-metallic material.

4. The fuel cell current collection system of claim 1, wherein the end plate is formed of an electrically nonconductive material.

5. The fuel cell current collection system of claim 1, wherein the end plate is formed of a thermally insulating material.

6. The fuel cell current collection system of claim 1, wherein the current collector comprises one or more bolts.

7. The fuel cell current collection system of claim 1, wherein the current collector comprises one or more pins.

8. The fuel cell current collection system of claim 1, wherein the end plate assembly further comprises one or more current collecting plates configured to electrically couple an active area of the fuel cell stack with the current collector.

9. The fuel cell current collection system of claim 8, wherein at least one of the one or more current collecting plates is formed predominantly of a metallic material.

10. The fuel cell current collection system of claim 1, wherein the end plate assembly comprises a current collecting plate configured to fit within a recess of the end plate.

11. The fuel cell current collection system of claim 1, wherein the end plate assembly comprises a current collecting plate configured to fit within a recess formed in a component of the fuel cell stack.

12. The fuel cell current collection system of claim 11, wherein the component of the fuel cell stack comprises a flow field plate of the fuel cell stack.

13. A fuel cell current collection system, comprising:

means for providing a stack of fuel cells arranged between end plates in a predetermined stacking direction; and

means for collecting current from the fuel cell stack, the means for collecting current including a current collector passing through an end plate and electrically coupled to the fuel cell stack.

14. The system of claim 13, wherein the means for collecting current comprises one or more current collecting plates electrically coupling an active area of the fuel cell stack with the current collector.

15. The system of claim 13, wherein the means for collecting current comprises a current collecting disposed in a recessed portion of a component of the fuel cell stack.

16. The system of claim 13, wherein the means for collecting current comprises a current collecting plate disposed in a recessed portion of the end plate.

17. A fuel cell assembly, comprising:

a fuel cell stack comprising fuel cells arranged in a predetermined stacking direction; and

a compression apparatus comprising two or more compression mechanisms, each compression mechanism configured to preferentially compress a separate region of the fuel cell stack.

18. The fuel cell assembly of claim 17, wherein the compression apparatus comprises:

a first compression mechanism configured to preferentially compress an outer region of the fuel cell stack; and

a second compression mechanism configured to preferentially compress an inner region of the fuel cell stack.

19. The fuel cell assembly of claim 17, wherein the compression apparatus comprises:

a first compression mechanism configured to preferentially compress a seal region of the fuel cell stack; and

a second compression mechanism configured to preferentially compress an active region of the fuel cell stack.

20. The fuel cell assembly of claim 17, wherein the compression apparatus comprises:

a first compression mechanism comprising:

first and second outer compression plates respectively disposed at opposing ends of the fuel cell stack; and

one or more outer connecting members extending between the first and the second outer compression plates, the first compression mechanism configured to facilitate preferential compression of a first region of the fuel cell stack; and

a second compression mechanism, comprising:

first and second inner compression plates respectively disposed at opposing ends of the fuel cell stack; and

one or more inner connecting members extending between the first and the second inner compression plates, the second compression mechanism configured to facilitate preferential compression of a second region of the fuel cell stack.

21. The fuel cell assembly of claim 20, wherein:

the one or more outer connecting members comprises a first set of rods extending through peripheral regions of the first and second inner compression plates and the first and second peripheral regions of the second outer compression plates; and

the one or more inner connecting members comprises a second set of rods extending through peripheral regions of the first and second inner compression plates.

22. The fuel cell assembly of claim 20, wherein at least one of the first and the second outer compression plates comprises a protrusion configured to facilitate compression of an inner region of the fuel cell stack.

23. The fuel cell assembly of claim 17, wherein the compression apparatus comprises:

a first compression mechanism comprising:

first and second compression plates respectively disposed at opposing ends of the fuel cell stack; and

one or more connecting members extending between the first and the second compression plates, the first compression mechanism configured to facilitate compression of a peripheral region of the fuel cell stack; and

a second compression mechanism extending through a substantially central portion of at least one of the first and the second compression plates and configured to compress an inner region of the fuel cell stack.

24. The fuel cell assembly of claim 23, wherein the at least one of the first and the second compression plates comprises a threaded hole and the second compression mechanism comprises a bolt extending through the threaded hole.

25. The fuel cell system of claim 17, wherein the two or more compression mechanisms are independently activatable to preferentially compress separate regions of the fuel cell stack.

26. The fuel cell system of claim 17, wherein one of the compression mechanisms is configured to compensate for mechanical distortion of another of the compression mechanisms.

27. A system for compressing a fuel cell stack, comprising:

means for preferentially compressing a first region of the fuel cell stack using a first compression mechanism; and

means for preferentially compressing second region of the fuel cell stack using a second compression mechanism.

28. The system of claim 27, wherein the means for preferentially compressing the first region and the means for compressing the second region are independently activatable.

29. The system of claim 27, further comprising means for compensating for the mechanical distortion of one of the compression mechanisms using another of the compression mechanisms.

30. A system for compressing a fuel cell stack, comprising:

means for preferentially compressing a seal region of the fuel cell stack; and

means for preferentially compressing an active region of the fuel cell stack.

31. A fuel cell system, comprising:

a fuel cell stack comprising fuel cells arranged in a predetermined stacking direction; and

a compression apparatus comprising compression mechanisms configured to preferentially compress separate regions of the fuel cell stack, the compression mechanisms including a current collection/compression mechanism configured to preferentially compress a first region of the fuel cell stack and to collect current from the fuel cell stack.

32. The fuel cell system of claim 31, wherein the current collection/compression mechanism comprises a current collector having a substantially longitudinal orientation with respect to the stacking direction.

33. The fuel cell system of claim 31, wherein the current collection/compression mechanism comprises:

an end plate; and

a current collector extending through the end plate, electrically coupled to the fuel cell stack, and configured to collect current from the fuel cell stack.

34. The fuel cell system of claim 33, wherein the end plate is formed of a non-metallic material.

35. The fuel cell system of claim 33, wherein the end plate is formed of an electrically nonconductive material.

36. The fuel cell system of claim 33, wherein the end plate is formed of a thermally insulating material.

37. The fuel cell system of claim 33, wherein the current collector comprises one or more bolts.

38. The fuel cell system of claim 33, wherein the current collector comprises one or more pins.

39. The fuel cell system of claim 33, wherein the end plate includes a recess and a current collecting plate is disposed within the recess, the current collecting plate configured to electrically couple an active area of the fuel cell stack with the current collector.

40. The fuel cell system of claim 33, wherein the current collection/compression mechanism further comprises one or more current collecting plates configured to electrically couple an active area of the fuel cell stack with the current collector.

41. The fuel cell system of claim 40, wherein:

the first current collecting plate comprises a recess and is configured to electrically couple an active area of the fuel cell stack with the second current collecting plate; and

the second current collecting plate is disposed within the recess of the first current collecting plate and is configured to electrically couple the first current collecting plate with the current collector.

42. The fuel cell system of claim 41, wherein the first current collecting plate is formed predominantly of graphite.

43. The fuel cell system of claim 41, wherein the second current collecting plate is formed of a metallic material.

44. The fuel cell system of claim 33, wherein the end plate is formed of an electrically non-conductive material.

45. The fuel cell system of claim 31, wherein the compression apparatus comprises:

a peripheral compression mechanism configured to preferentially compress an outer region of the fuel cell stack; and

the current collection/compression mechanism configured to preferentially compress an inner region of the fuel cell stack.

46. The fuel cell system of claim 31, wherein the compression apparatus comprises:

a seal compression mechanism configured to preferentially compress a seal region of the fuel cell stack; and

the current collection/compression mechanism configured to preferentially compress an active region of the fuel cell stack.

47. The fuel cell system of claim 31, wherein the compression apparatus comprises:

a first compression mechanism comprising:

first and second compression plates respectively disposed at opposing ends of the fuel cell stack; and

one or more connecting members extending between the first and the second compression plates, the first compression mechanism configured to facilitate compression of a peripheral region of the fuel cell stack; and

the current collection/compression mechanism extending through a substantially central portion of at least one of the first and the second compression plates and configured to compress an inner region of the fuel cell stack.

48. The fuel cell system of claim 47, wherein the at least one of the first and the second compression plates comprises a threaded hole and the second compression mechanism comprises a bolt extending through the threaded hole.

49. The fuel cell system of claim 31, wherein the compression mechanisms are independently activatable.

50. The fuel cell system of claim 31, wherein at least one of the compression mechanisms is configured to compensate for mechanical distortion of another of the compression mechanisms.

51. The fuel cell system of claim 31, wherein:

the fuel cell system further comprises an automobile; and

the fuel cell stack and the compression apparatus are incorporated in a fuel cell power unit configured to supply power to the automobile.

52. The fuel cell system of claim 31, wherein:

the fuel cell system comprises a computer; and

the fuel cell stack and the compression apparatus are incorporated in a fuel cell power unit configured to supply power to the computer.

53. The fuel cell system of claim 31, wherein the fuel cell stack and the compression apparatus are incorporated in a fuel cell power supply used to supply power to a load.

54. The fuel cell system of claim 31, wherein:

the fuel cell system comprises an auxillary power system; and

the fuel cell stack and the compression apparatus are incorporated in a fuel cell power unit configured to supply power to the auxiliary power system.

55. The fuel cell system of claim 31, wherein:

the fuel cell system comprises a residential heat and electricity cogeneration unit; and

the fuel cell stack and the compression apparatus are incorporated in a fuel cell power unit configured to supply power to the residential heat and electricity cogeneration unit.

56. A fuel cell assembly, comprising:

means for preferentially compressing a peripheral region of the fuel cell stack using a first compression mechanism; and

means for preferentially compressing an active region of the fuel cell stack and collecting current from the fuel cell stack using a second compression mechanism.

57. A fuel cell end plate, comprising:

a frame; and

a structural element at least partially covering the frame.

58. The fuel cell end plate of claim 57, wherein:
the frame comprises a metallic material; and
the structural element comprises a plastic material.

59. The fuel cell end plate of claim 57, wherein the structural element comprises a substantially electrically nonconductive material.

60. The fuel cell end plate of claim 57, wherein the structural element comprises a substantially thermally insulating material.

61. The fuel cell end plate of claim 57, wherein:
the frame comprises a star-shaped structure; and
the structural element at least partially covers the frame.

62. The fuel cell end plate of claim 61, wherein the star-shaped structure comprises frame members extending radially from a central area.

63. The fuel cell end plate of claim 61, wherein the star-shaped structure comprises:
frame members extending radially from a central area; and
connecting members disposed between the frame members.

64. The fuel cell end plate of claim 57, further comprising a hole in a central region of the end plate.

65. The fuel cell end plate of claim 64, wherein the hole is configured to provide electrical access to the fuel cell stack and facilitate current collection from the fuel cell stack.

66. The fuel cell end plate of claim 64, wherein the hole is configured to provide mechanical access to the fuel cell stack and facilitate compression of a region of the fuel cell stack.

67. The fuel cell end plate of claim 57, wherein;

the frame is formed of a first material; and

the structural element is formed of a second material, the first material having a higher modulus of elasticity than the second material.